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to vary indirectly with the distance from the crown. Roots of French crab, so extensively used in America as stock, are less hardy than roots from scions of an average variety of apple. It is of considerable interest to note that heavy dormant pruning, thinning of fruit, and application of nitrate fertilizers prolonged the growth period, lengthened the rest period, and consequently reduced the early forcing of growth in spring with subsequent injury by late frosts. The selection of trees with long rest period also helps to obviate the latter injury. Of apple blossom tissue, the pollen was found most resistant to low temperature.

The work presented in this bulletin is of such a character as to be of great interest alike to those engaged in "pure" science and to those whose chief interest is in the applied side.—L. I. KNIGHT.

Mitosis in Tetraspora.—In the green alga *Tetraspora lubrica*, MCALLISTER[6] finds that mitosis, so far as can be made out from the very small nuclei, corresponds in its essential features with that in higher plants. In the cell which is to give rise to 8 gametes, the resting nucleus contains a reticulum with net knots and a nucleolus. During the prophases, the reticulum develops chromatic bodies which apparently become arranged in a row to form a spirem thread. The nucleolus takes no part in this process. The spirem segments to about 13 chromosomes, which divide and pass to opposite poles. Details of spindle-formation were not made out, but there was found no reason to believe that *Tetraspora* differs from higher plants in this respect. Centrosomes or centrospheres, which might be expected on account of their reported presence in the gamete-forming cells of certain bryophytes, were not found. Cell-division is brought about by the splitting of a granular cell plate formed by the central spindle. The splitting takes place from the center outward.

The second and third mitoses follow quickly, but in each case the daughter nuclei enter the resting stage. The single pyrenoid of the original cell remains unchanged through the three divisions, so that it comes to lie in only one of the 8 gamete cells. In each of the other 7 cells one appears to arise *de novo* from the cytoplasm. The entire pyrenoid is said to fragment to form several starch bodies.

Since *Tetraspora* and other green algae resemble higher plants so closely in mitosis and differ so widely from the Euglenidae, the theory that the Chlamydomonadaceae, to which *Tetraspora* is held to be so closely related, have arisen from the Euglenidae is believed by MCALLISTER to be excluded.—L. W. SHARP.

Mitosis in Preissia.—In many papers dealing with mitosis in liverworts, attention has been focused chiefly upon the centrosome and related structures.

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[6] MCALLISTER, F., Nuclear division in *Tetraspora lubrica*. Ann. Botany 27: 681–697. *pl. 56*. 1913.

In a study of *Preissia commutata*, Miss Graham[7] has emphasized the behavior of the chromatin. In the vegetative cells of the gametophyte, the earliest prophase is marked by an elongation of the nucleus and the appearance of large chromatin masses on the linin strands. These strands thicken, forming a spirem upon which the chromatin is borne in the form of chromomeres. The spirem shows a temporary contraction, after which it segments to form 8 chromosomes. The disappearance of the nucleolus is sudden and coincident with the appearance of the central spindle fibers, which suggests a material relationship between these structures. At telophase the chromosomes elongate to slender threads which lose their individuality in the reticulum of the daughter nuclei.

In the spore mother cell the reticulum gives rise to a leptonema spirem. Many threads lie side by side, but whether this represents a parallel conjugation or is without special meaning was not determined. Synizesis ensues. After the knot loosens up, the spirem thickens and for a time the chromomeres become more prominent. During a second contraction the spirem splits longitudinally and soon segments to form the bivalent chromosomes. The further behavior presents no unusual features.

In both somatic and heterotypic prophases there are hyaline caps at the poles of the nucleus, and in them, at least in the former case, the spindle fibers are formed. Centrosomes or centrospheres were not found at any stage.—L. W. SHARP.

Plant breeding in Sweden.—On account of the important practical results obtained at the Svälof Institute, as well as because of contributions to the science of heredity resulting from the extensive and exact investigations carried on at this station, an authentic account of its history, ideals, and methods coming from an authoritative source is especially welcome. The present director, NILSSON,[8] sketches briefly the origin of the organization, emphasizing the object, which was to arrive at absolutely practical results, and giving in some detail the sources of its income. In the development of methods, attention is directed to the comparatively small results coming from "selection in mass" as practiced up to 1891, when "pedigree culture" was introduced. Thus the method of isolating and studying pure lines derived from a single individual was practiced at the Svälof station for ten years before it was advocated by DE VRIES in his *Die Mutationstheorie* in 1901. With the adoption of this radically new method, results have been more abundant. NILSSON emphasizes the fact that the isolation of elementary species is only a preparatory auxiliary for getting out properly the material to be utilized, the essential thing being testing the practical value of the material and making the best selections. To

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[7] GRAHAM, MARGARET, Studies in nuclear division of *Preissia commutata*. Ann. Botany **27**:661–681. *pls. 54, 55.* 1913.

[8] NILSSON, H. HJALMAR, Plant breeding in Sweden. Jour. Hered. **5**:281–296. 1914.